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METHOD FOR OBTAINING STATISTICAL ACCELERATION DATA IN A DESTROY--ETC(U)
OCT 64 G E CHRISTENSEN, D A NICHOLS

UNCLASSIFIED USL-TM-933-355-64 NL

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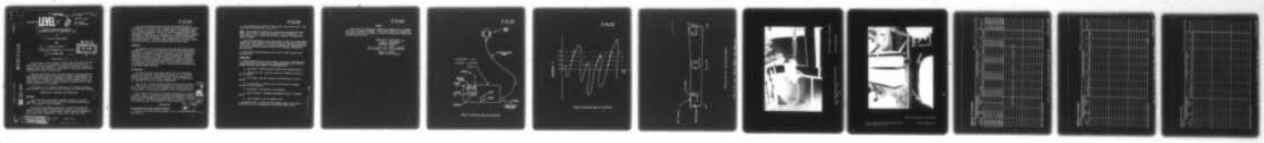

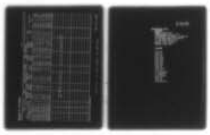

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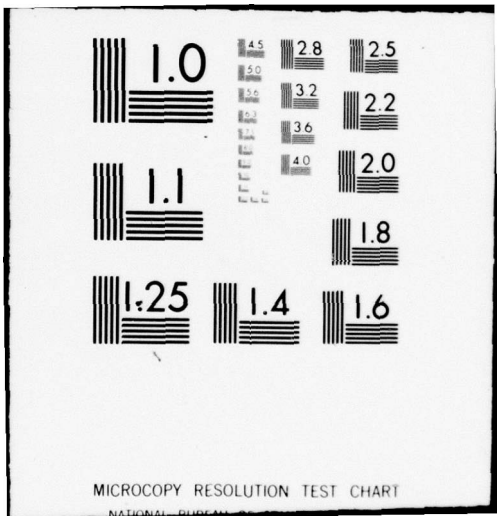
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MICROCOPY RESOLUTION TEST CHART

METHOD FOR OBTAINING STATISTICAL ACCELERATION DATA IN A DESTROYER AT SEA.

By

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and

Donald A. Nichols

USL Technical Memorandum No. 933-355-64

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14p.

ABSTRACT

INTRODUCTION

USL-TM-933-355-64

In the design of hoist systems, towlines, and towed bodies for variable depth sonar, it is necessary to have quantitative data on the forces acting on VDS components. These data are especially necessary in designing large VDS systems where the forces on towed bodies and in towlines may be as high as 75,000 pounds.

Among the significant forces are those that are caused by vertical ship accelerations, which can be sensed by suitable accelerometers. If statistical accelerometers on destroyers are used to obtain data in the North Atlantic, a statistical presentation of the accumulated data over a year's time can be made to form a reasonably accurate picture of vertical accelerations to be expected.

The purpose of this technical memorandum is to describe accelerometer equipment and to explain how the data should be taken and recorded.

ABSTRACT

DESCRIPTION OF EQUIPMENT AND INSTALLATION

Equipment

Each statistical-accelerometer assembly consists of two major components: (1) the sensor unit and (2) the counter-and-power-supply unit. The assembly is shown by Figure 1.

The vertical acceleration sensor unit is the Giannini Controls Corporation Model 2432; its size is about 3 inches x 1.3 inches x 1.4 inches. This unit senses instantaneous values of positive acceleration that exceed these 4 thresholds: 1.20g, 1.35g, 1.50g, and 1.65g.

The counter-and-power-supply unit has an approximate size of 8 inches wide x 17 inches long x 8 inches high and an approximate weight of 35 pounds, including 45 feet of MCOS-6 cable. The multiple counter is the counting component of Giannini Controls Corporation Model 2432 statistical accelerometer. It records, on 4 electromechanical counters, the number of times the sensor experiences the positive accelerations that exceed the set thresholds. Each counter records the count for a particular threshold. The power supply converts the 115-volt AC source to 38 volts DC at 1.5 amps and requires about 100 watts input.

Operation

An example of how bow acceleration could vary with time is shown in Figure 2. The X's on the curve show the times that acceleration thresholds are counted by the multiple counter. During the period of time shown, counter #1 registered 4 instances where the acceleration exceeded the threshold of 1.20g; counter #2 registered 3 instances where the acceleration exceeded the threshold of 1.35g; counter #3 registered 3 instances where the acceleration exceeded the threshold of 1.50g; and counter #4 registered 2 instances where the acceleration exceeded the threshold of 1.65g. Counters located amidships and at the stern behave similarly.

Installation

The three vertical acceleration sensor units must be mounted vertically and rigidly. They should be located in: (1) the after-steering ram room at the waterline and near the aft perpendicular; (2) the compartment at the midship location, and (3) in the bow at the waterline and near the forward perpendicular.

Each of the 3 counter-and-power-supply units should be mounted on a shelf within a 45-foot cable length of its sensor and such that the 4 counters of each unit can be easily read. It should also be located within a 25-foot cable length of a 115-volt AC power outlet.

The 2 units at each of the 3 locations are supplied and installed by USNUSL. Figure 3 diagramatically shows an installation; figures 4 and 5 are photographs of the 2 units that were installed in the USS MOALE (DD-693). The MOALE installation was for 2 months of use only; the clamped sensor is not typical of a 1-year installation.

INSTRUCTIONS

Accelerometer Data (Bow, Midship, Fantail):

1. Connect the counter-and-power-supply unit to a 115-volt AC source. (See figure 1).

2. Turn counting unit switch to "ON" position upon leaving port. (The light above the switch will then be on).

Note: The counting unit should run continuously throughout the test; do not turn it off or permit the AC source to be disconnected. If power failure occurs, record the duration of same on the proper data sheet or sheets.

3. Record simultaneously, on the data sheets provided, the accelerometer readings and other required data every 4 hours, on the hour, during the time at sea. See figures 6, 7, and 8 for specimen and blank data sheets for use in recording acceleration data for the fantail, midship, and bow locations.

4. Turn counter-and-power-supply unit switch to "OFF" position upon entering port.

Bridge Data

1. Record bridge data once every 4 hours, on the hour, simultaneously with recording data from each counter-and-power-supply unit. Fill in bridge data sheet (see Figure 9) as explained below:

a. ship speed - obtain from most accurate and reliable source.

b. direction of sea - make best estimate in degrees relative to ship's heading.

c. wave height- make best estimate from observation at ship's fantail.

d. wind direction - read directly from indicator in degrees relative to ship's heading.

e. wind speed - read directly from indicator.

f. ship's position - determine approximate position to nearest minute.

g. ship's heading - give in degrees, true.

2. Bridge data are to be derived from readings taken at the time of reading and not as an average over the previous 4-hour period.

REMARKS

Blank data forms USNUSL-917, USNUSL-917A, USNUSL-917B, and USNUSL-917C will be supplied by USNUSL. One of the writers will contact each ship about once every two months to collect the data and to discuss any problems that may occur.

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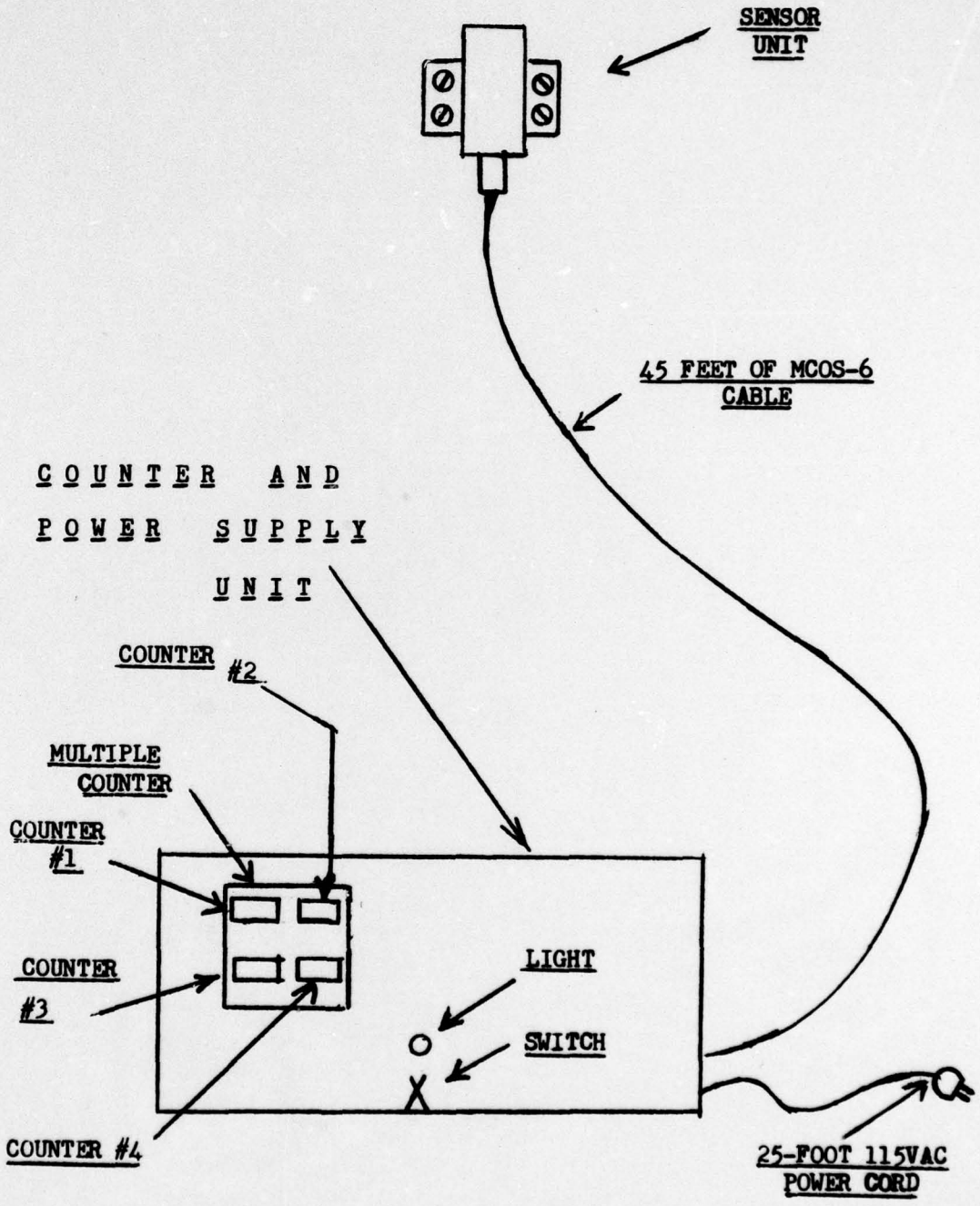


Figure 1 to USL Tech. Memo. No. 933-355-64

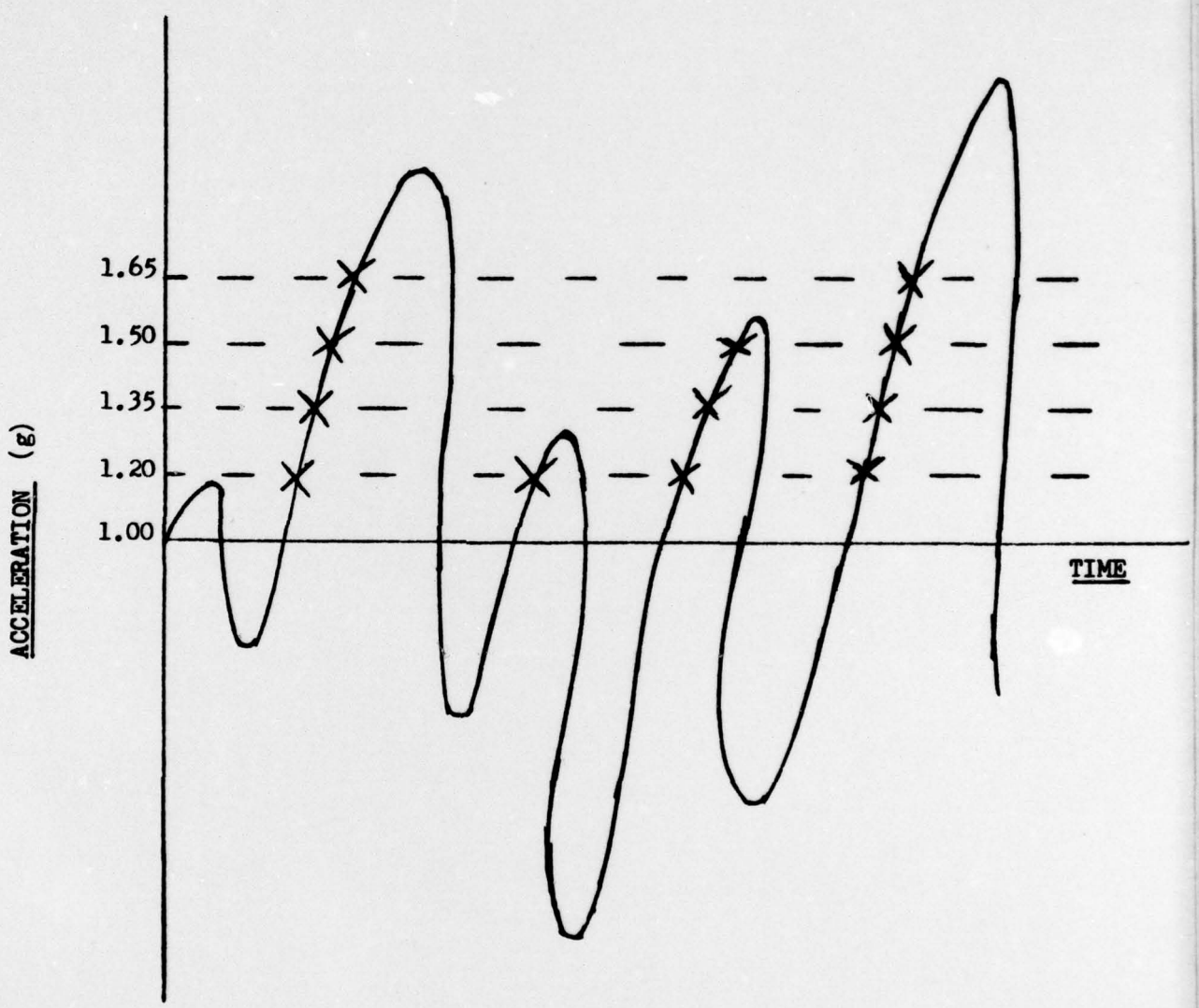
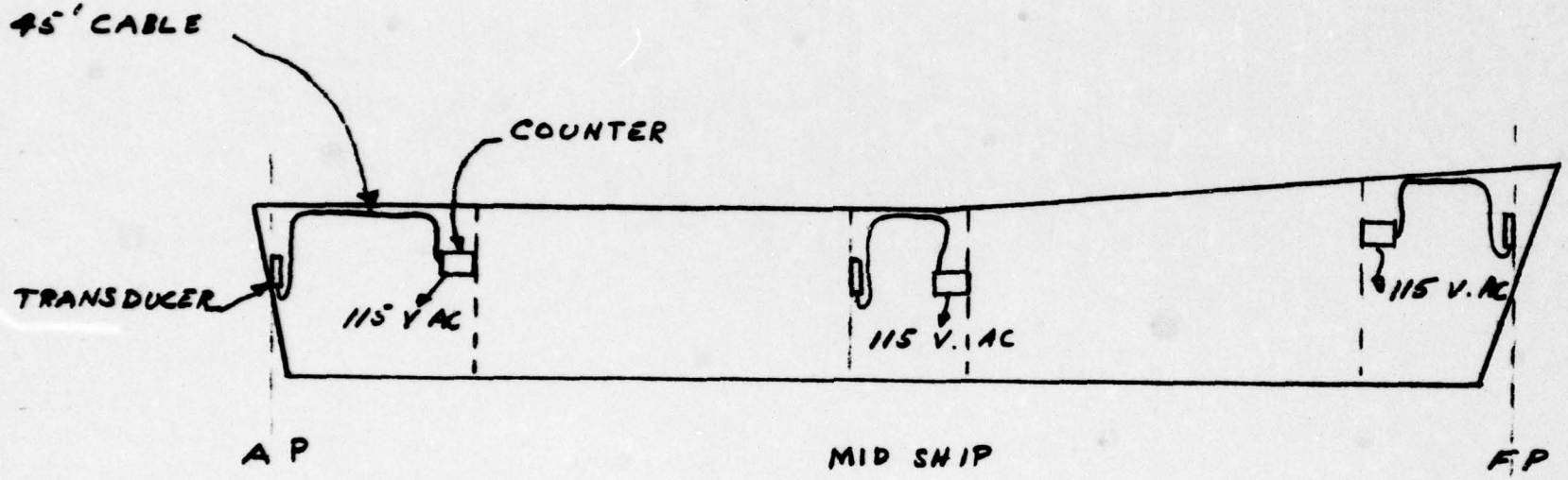
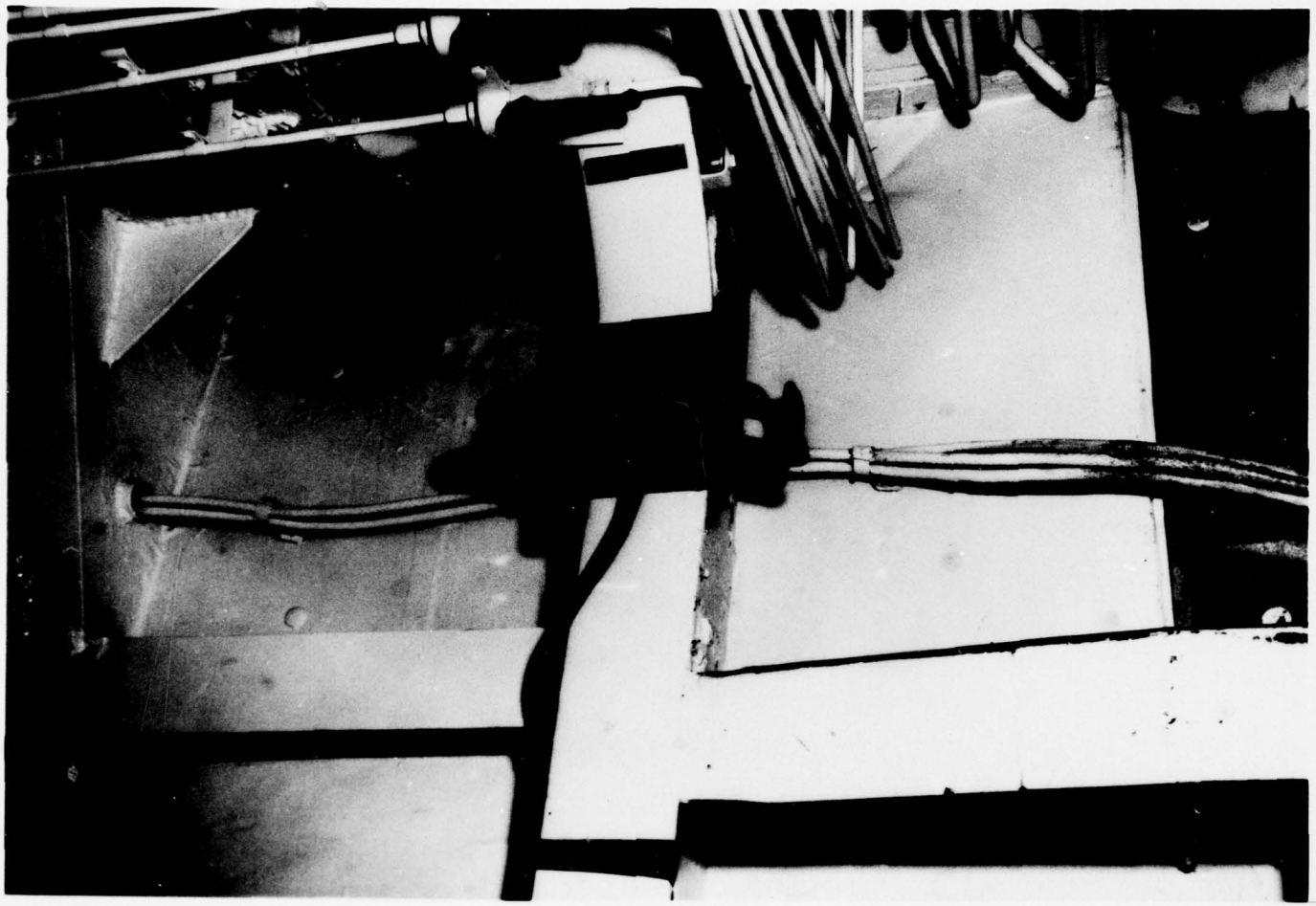


Figure 2 to USL Tech. Memo. No. 933-355-64



INSTALLATION ARRANGEMENT

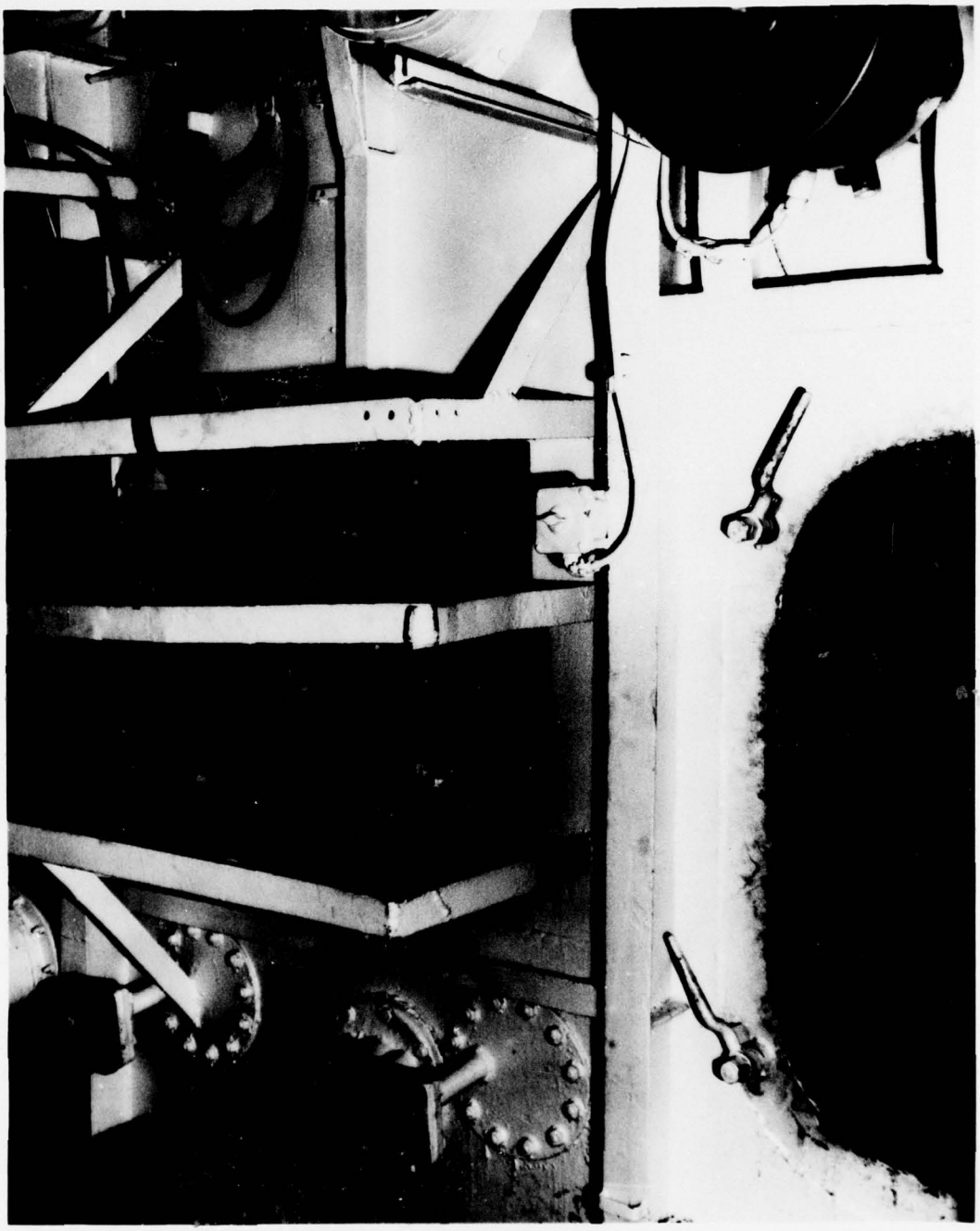
FIG. 3 TO USL TECH. MEMO 933-355-64



USL Tech Memo No. 933-365-64

U. S. Navy Underwater Sound Laboratory
NP24 - 24837 - 10 - 64

Official Photograph



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U. S. Navy Underwater Sound Laboratory
NP24 - 24838 - 10 - 64

Official Photograph

FANTAIL DATA FOR ACCELEROMETER
USN-USL-917B

SHIP _____

DATE YEAR 1965	MEASURING PERIOD		ACCELERATION COUNTER								PERSON TAKING DATA
	TIME OF DAY (LOCAL)	DURATION (Hours)	#1		#2		#3		#4		
			READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	
12 FEB	2400	—	9726		6856		3964		3894		ENS. PARKER
13 FEB	0400	4	9734		6863		3965		3894		ENS. PARKER
13 FEB	0800	4	9759		6889		3970		3896		ENS. PARKER
13 FEB	1200	4	9782		6908		3976		3897		ENS. PARKER
13 FEB	1600	4	9782		6908		3976		3897		ENS. PARKER
13 FEB	2000	4	9782		6908		3976		3897		ENS. PARKER
13 FEB	2400	4	9782		6908		3976		3897		ENS. PARKER

(SPECIMEN DATA SHEET)

9/23/64- 500 - FIRST RUN- EXPERIMENTAL

FIG. 6 TO USL TECH. MEMO 933-355-64

MIDSHIP DATA FOR ACCELEROMETER
USN-USL-917A

SHIP _____

DATE YEAR 196__	MEASURING PERIOD		ACCELERATION COUNTER								PERSON TAKING DATA
	TIME OF DAY (LOCAL)	DURATION (Hours)	#1		#2		#3		#4		
			READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	

9/23/64-300-FIRST RUN-EXPERIMENTAL

FIG 7 TO USL TECH. MEMO 933-355-64

BOW DATA FOR ACCELEROMETER
USN-USL-917

SHIP _____

DATE YEAR 196__	MEASURING PERIOD		ACCELERATION COUNTER								PERSON TAKING DATA
	TIME OF DAY (LOCAL)	DURATION (Hours)	#1		#2		#3		#4		
			READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	READING	DIFFERENCE	

9/23/64-500-FIRST RUN-EXPERIMENTAL

BRIDGE DATA FOR ACCELEROMETER
USN-USL-917C

SHIP _____

DATE YEAR 1965	TIME OF DAY (LOCAL)	SHIP SPEED (Knots)	SEA		RELATIVE WIND		SHIP POSITION		SHIP COURSE (True)	PERSON TAKING DATA
			DIRECTION (Degrees-Relative)	WAVE HEIGHT (Fantail)	DIRECTION (Degrees-Relative)	SPEED (Knots)	LATITUDE (Degrees-Relative)	LONGITUDE (Degrees-Relative)		
12 FEB	2400	14	305	15	300	33	34° - 47' N	73° - 47' W	024	ENS. J. DOE
13 FEB	0400	11	350	18	020	38	35° - 24' N	73° - 22' W	024	ENS. J. DOE
13 FEB	0800	10	025	25	330	50	36° - 14' N	72° - 54' W	015	ENS. J. DOE
13 FEB	1200	10	020	25	340	47	36° - 35' N	72° - 24' W	000	ENS. J. DOE
13 FEB	1600	13	345	6	330	10	37° - 26' N	72° - 1' W	010	ENS. J. DOE
13 FEB	2000	15	330	3	315	15	38° - 20' N	71° - 54' W	010	ENS. J. DOE
13 FEB	2400	22	350	3	335	15	39° - 46' N	71° - 34' W	010	ENS. J. DOE

(SPECIMEN DATA SHEET)

9/23/64 - 500 - FIRST RUN - EXPERIMENTAL

FIG. 9 TO USL TECH. MEMO 933-355-64

USL Tech. Memo.
No. 933-355-64

Distribution List

External

BUSHIPS (Code 1633)
COMCRUDESLANT (Code 413)(2)
COMDESDEVGRU TWO (CMDR H. Fridge)(2)
CO, USS HUGH PURVIS (DD-709)(2)
CO, USS MOALE (DD-693)(2)
BUSHIPS (Code 1633D)(2)
BUSHIPS (Code 1622)

Internal

Code 100
Code 101
Code 900
Code 900A
Code 900B
Code 900C
Code 930
Code 930A
Code 933
Code 933.2
Code 933.3
G. Christensen
S. Rupinski
Code 930S(3)
Code 902
Code 904
Code 904.2(5)